



# **SPILLS ACTION CENTRE**

## **SUMMARY REPORT OF 1993 SPILLS**

**NOVEMBER 1994**

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Spill action centre : summary  
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**SPILLS ACTION CENTRE**  
**SUMMARY REPORT OF 1993 SPILLS**

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## EXECUTIVE SUMMARY

The Ontario Ministry of Environment and Energy's Spills Action Centre receives and initiates responses to reports of spills and other urgent environmental incidents on a 24-hour per day basis. This report provides a summarized review of spills reported to the Ministry during the calendar year of 1993, and compares this information to that obtained in previous years. The SAC documented 14,371 occurrences in 1993. Spills accounted for 4,841 of these occurrences; the remainder included a combination of Ministry-required notifications other than spills, and environmental complaints from the general public.

The number of spills reported to the Ministry in 1993 declined by about 3% from 1992. This is the third consecutive yearly decrease in reported spills. Fewer spills to water accounted for some of this decrease while the number of spills to land and air remained virtually unchanged.

Oils and fuels represented 57% of spilled materials; chemicals and chemical solutions accounted for 17%; wastes and waste waters 17%; gaseous emissions 6%; while other and unknown materials accounted for the remaining 3%. A large proportion of the reported spills involved small volumes: cumulatively, 20% of the spilled materials involved volumes less than 10 litres, 58% less than 100 litres and 88% less than 1000 litres.

About 26% of the spills had a confirmed environmental impact identified. Three-quarters of these involved soil contamination, and approximately one-tenth involved water pollution. Thirteen spills were reported to have resulted in human health and safety concerns.

Spill cleanup information from 1993 indicates that 41% of the spills were completely cleaned up and an additional 22% were partially cleaned up. The majority of the remainder involved spills to water where cleanup was more difficult, and some spills to the atmosphere which could not be cleaned up at all.

The industrial sectors with the largest proportions of reported spills were: transportation - 17%; petroleum - 10%; chemical - 6%; metallurgical - 6%; and general manufacturing - 5%. Public sector spills, including spills from electric utilities and sewage systems, accounted for about 15% of reported spills.

Motor vehicles were the largest source of spills, accounting for more than 30% of all reported spills. Spills from manufacturing and processing facilities accounted for an additional 21%.

In 1993, 1 206 of the spills reported to the Ministry were either entirely or partially discharged to water courses. Of these, 162 involved oil or chemical spills to the Great Lakes system including: 53 to Lake Ontario, 23 to the St. Clair River, 25 to the St. Lawrence River, 26 to Lake Huron, 11 to Lake Erie, and 9 to Lake Superior. The remainder were to the Detroit River, St. Marys River, and the Niagara River. Overall there were 41 fewer spills to the Great Lakes system in 1993 as compared to 1992.

All occurrences reported to the Ministry, including spills, are recorded on a computerized data management system called the Occurrence Report Information System. The information stored on this system is used to assist the Ministry and others, such as Environment Canada and the International Joint Commission on the Great Lakes, in identifying and evaluating environmental problems.

Ministry pollution abatement programs and spill reduction initiatives are developed or modified as trends or concerns are identified using this type of information. The Ministry has implemented a province-wide *Spills Prevention Strategy* requiring repeat dischargers to submit spill prevention and response plans to the Ministry and to incorporate better management practices. About 30 companies are currently involved in this process.

The Ministry is actively involved in planning for spill contingencies. The Ministry's Contingency Planning Program provides advice and assistance to industry and other government agencies that respond to spills. The Ministry is also responsible for the *Province of Ontario Contingency Plan for Spills of Oil and Hazardous Materials* which provides a mechanism to deal with major spills under provincial jurisdiction.

## INTRODUCTION

This report is the sixth annual summary of occurrences reported to the Ontario Ministry of Environment and Energy's Spills Action Centre. The purpose of this report is to provide a summarized review of spills reported to the Ministry during the calendar year of 1993 and to compare this information to that obtained in previous years.

### Ontario's Spills Legislation

The Environmental Protection Act (EP Act) defines a spill, with reference to a pollutant, as:

"...a discharge into the natural environment, from or out of a structure, vehicle or other container, and that is abnormal in quantity or quality in light of all the circumstances of the discharge." (Part X, Section 91(1)).

A spill is reportable if it causes or is likely to cause an adverse effect, such as injury or damage to property or to plant or animal life, harm or material discomfort to any person, or any other adverse effect listed in Section 1(1) of the Act. The person who had control of the pollutant immediately prior to the spill and the person who spills, causes, or permits the spill must report the discharge to the Ministry based on their determination of the likelihood of adverse effects.

Part X of the EP Act establishes:

- the requirement to immediately notify the Ministry, the municipality in which the spill occurred and, in some cases, the owner of the pollutant and the person in control (if they are not already aware of the spill);
- the duty to clean up spills;
- the right for municipalities to respond to spills and to recover costs;
- a process, as a last resort, for the Minister of Environment and Energy to direct Ministry staff or to order the discharger or anyone else to respond to the spills;
- the right to compensation for costs and damages incurred;
- the Environmental Compensation Corporation to provide limited assistance in compensating certain victims of spills.

### The Spills Action Centre

The Spills Action Centre (SAC) began operations on November 29, 1985, the same day that Part X of the EP Act came into force. The primary role of the SAC is to receive and initiate response to reports of spills and other urgent environmental matters on a 24-hour per day basis. The Ministry's province-wide, toll-free number (1-800-268-6060) is used by industry, response agencies and the public. As this telephone number has become better known, it has been used

increasingly for a variety of other environmental matters including a range of ministry-required notifications, in addition to environmental complaints from the general public. The SAC is also responsible for the Ministry's Contingency Planning Program, maintaining the Province of Ontario Contingency Plan for Spills of Oil and other Hazardous Materials, and promoting and reviewing the development of industrial and municipal spill contingency plans.

Environmental officers at the SAC evaluate all reported occurrences and decide what type of response is necessary. This may include any combination of the following:

- Providing immediate advice and direction to the person who reports an occurrence;
- Contacting suspected pollution sources in an attempt to verify and resolve the problem;
- Contacting various agencies or potentially affected parties as needed, for example, police, fire departments, local municipal authorities, health officials, Canadian Coast Guard, US authorities, etc.;
- Contacting local Ministry of Environment and Energy (MOEE) personnel to initiate a field response;
- Notifying senior MOEE management and coordinating Minister's orders or directions when necessary;
- Maintaining liaison with the agencies in charge of public safety in an emergency and coordinating MOEE's support for their efforts;
- Providing information on chemicals and cleanup techniques, either directly or through CANUTEC, Transport Canada's national 24-hour centre;

## The Occurrence Report Information System

All occurrences reported to the Ministry are recorded on a computerized database management system called the Occurrence Report Information System (ORIS). This system enables the Ministry to track the status of occurrences, and facilitates data retrieval for the purpose of preparing routine summaries and performing non-routine data searches. Each occurrence report consists of a text summarizing the incident and several coded fields which facilitate data retrieval. A sample occurrence report is included in Appendix I of this report.

Initial information on spills and emergencies is often incomplete and changes as more information becomes available. Since some incidents take a long time to resolve, the information presented in this report is a "snapshot" of the information that existed in the database at the time summaries were generated. However, it is expected that any changes to the information in the database will have only a minor effect on the summaries presented in this report.

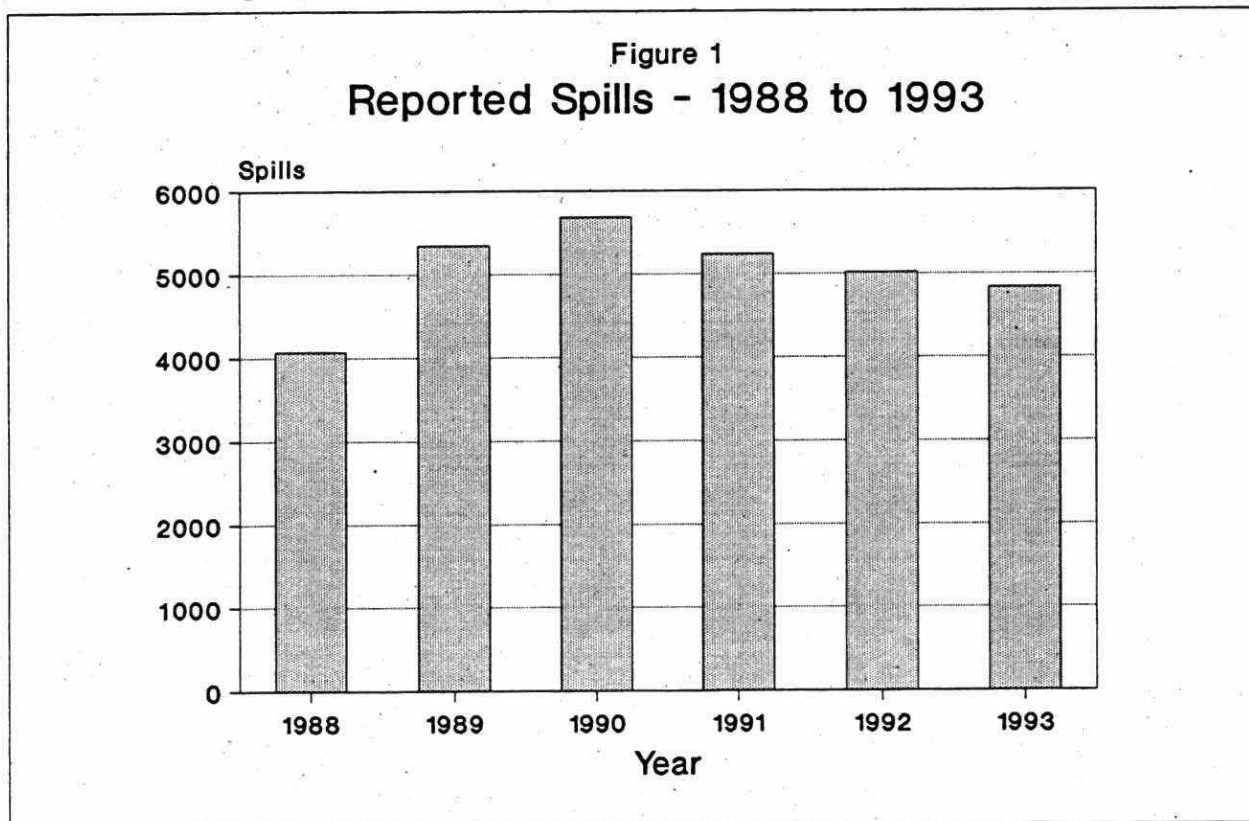


## SPILLS -- 1993 SUMMARY

This part of the report summarizes the number and type of spills reported to the Ministry of Environment and Energy during 1993. The report compares this information to the data from previous years.

### YEARLY SPILL TOTALS

Figure 1 depicts the change in the number of reported spills from 1988 to 1993. The total number of spills rose from 4,072 in 1988 to 5,686 in 1990. This was approximately a 40% increase. In 1991, the number of reported spills dropped by more than 8% to 5,239. This decrease continued in 1992 when there were 5,014 spills reported, representing a 5% decrease from 1991. In 1993, there were 4,841 spills reported, a decrease of 3% from 1992.



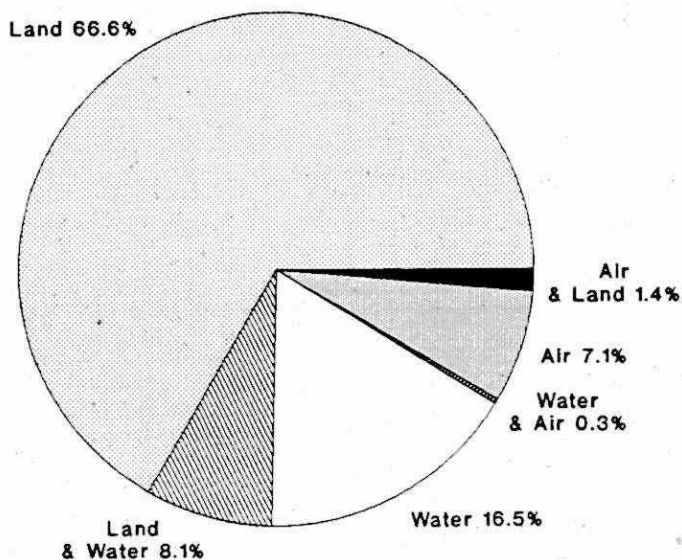
## SPILLS TO LAND, WATER AND AIR

In 1993 there were 3,222 spills to land, 801 spills to water and 345 spills to air. Spills which affected a combination of these media accounted for an additional 473 spills. Table 1 shows the number of spills which affected each of these media and Figure 2 shows the relative percentages of these spills. Spills to land accounted for 67% of all spills, and 17% of all spills were discharges to water. An additional 7% of spills were discharges to land and water. Spills to air, water and air, and air and land accounted for 9% of all spills.

**TABLE 1**  
**Spills By Receiving Medium – 1988 to 1993**

MEDIUM	YEAR					
	1993	1992	1991	1990	1989	1988
Land	3 222	3 194	3 117	3 144	2 996	2 261
Land & Water	390	475	524	467	355	243
Water	801	965	1 050	1 305	1 135	969
Water & Air	15	13	18	23	8	5
Air	345	311	447	649	776	543
Air & Land	68	56	81	98	75	51
<b>TOTAL</b>	<b>4 841</b>	<b>5 014</b>	<b>5 237</b>	<b>5 686</b>	<b>5 345</b>	<b>4 072</b>

**Figure 2**  
**Spills By Receiving Medium - 1993**





## LOCATION OF SPILLS

Municipalities with the largest population generally have the greatest number of reported spills. However, due to the concentration of industrial activities, a proportionately higher number of spills occur within the boundaries of some municipalities. Table 2 shows the number of spills that occurred within each upper-tier municipality in 1993<sup>1</sup>.

**TABLE 2**  
**Spills By Municipal Location**

MUNICIPALITY	SPILLS 1993	MUNICIPALITY	SPILLS 1993
Metropolitan Toronto	495	Bruce County	64
Hamilton-Wentworth R.M.	290	Frontenac County	62
Ottawa-Carleton R.M.	266	Sudbury District	57
Niagara R.M.	247	Peterborough County	53
Peel R.M.	242	Kent County	53
Thunder Bay District	239	Grey County	52
Sudbury R.M.	181	Timiskaming District	51
York R.M.	176	Parry Sound District	47
Lambton County	150	Rainy River District	43
Simcoe County	138	Northumberland County	41
Waterloo R.M.	127	Oxford County	39
Leeds & Grenville County	126	Huron County	37
Durham R.M.	125	Prescott & Russell County	37
Haldimand-Norfolk R.M.	122	Lanark County	36
Stormont, Dundas & Glengarry County	112	Brant County	32
Halton R.M.	111	Lennox & Addington County	31
Kenora District	99	Elgin County	28
Essex County	88	Victoria County	27
Algoma District	85	Perth County	22
Nipissing District	85	Dufferin County	20
Cochrane District	84	Haliburton County	13
Middlesex County	82	Manitoulin District	11
Renfrew County	78	Prince Edward County	10
Wellington County	78	Out-of-Province	4
Hastings County	77		
Muskoka D.M.	68	<b>TOTALS</b>	<b>4841</b>

<sup>1</sup> An expanded version of this table, including population & area data for each municipality, is in Appendix V.

## TYPES AND VOLUMES OF MATERIALS SPILLED

The 4 841 spills reported in 1993 involved a total of 4 995 spilled materials. A number of spills involved more than one spilled material; therefore, the total number of materials spilled exceeds the total number of reported spill occurrences. ORIS has five categories of materials: oils, chemicals, gases, wastes, and other materials. Table 3 compares the number of spills by material group and year and Figures 3 and 4 show the relative number of spills by material groups, and volume and material type, respectively. This information is discussed in the section that follows. The results from 1993 are similar to previous years, except for a moderate increase in the number of chemicals spilled.

**TABLE 3**  
**Spills By Material Group – 1988 to 1993**

MATERIAL GROUP	YEAR					
	1993	1992	1991	1990	1989	1988
Oils	2852	3060	2965	3144	2831	2136
Chemicals	864	784	982	1031	1118	798
Gases	305	326	472	717	864	546
Wastes	865	942	948	1032	763	602
Other	66	65	92	30	32	24
Unknown	43	34	32	37	81	96
<b>TOTALS</b>	<b>4995</b>	<b>5211</b>	<b>5491</b>	<b>5991</b>	<b>5689</b>	<b>4202</b>

Table 4 shows material groupings summarized by the volume spilled. An expanded summary of materials and volumes is presented in chart form in Appendix II. A large portion of reported spills involved small volumes. Cumulatively, in spills where the volume of the spilled pollutant was known, 20% of the spilled materials involved volumes of less than 10 litres, 58% involved volumes less than 100 litres, 88% involved volumes less than 1,000 litres, and 95% involved volumes less than 10,000 litres. These figures are indicative of a continuing trend by industry and others to report small volume spills. Figure 4 illustrates these trend graphically for the three major material categories - oils, chemicals and wastes.

**TABLE 4**  
**Spills By Material Group And Volume**

MATERIAL GROUP	VOLUME (Litres)						Unknown
	0 to 10	10 to 100	100 to 1 000	1 000 to 10 000	10 000 to 100 000	More than 100 000	
Oils	480	1028	698	74	17	4	551
Chemicals	151	210	186	72	19	3	223
Gases	13	20	23	9	3	8	229
Wastes	41	82	117	89	41	59	436
Other	1	5	11	11	7	2	29
Unknown	1	6	3	1			32
<b>TOTALS</b>	<b>687</b>	<b>1351</b>	<b>1038</b>	<b>256</b>	<b>87</b>	<b>76</b>	<b>1500</b>

Figure 3  
Spills By Material Group

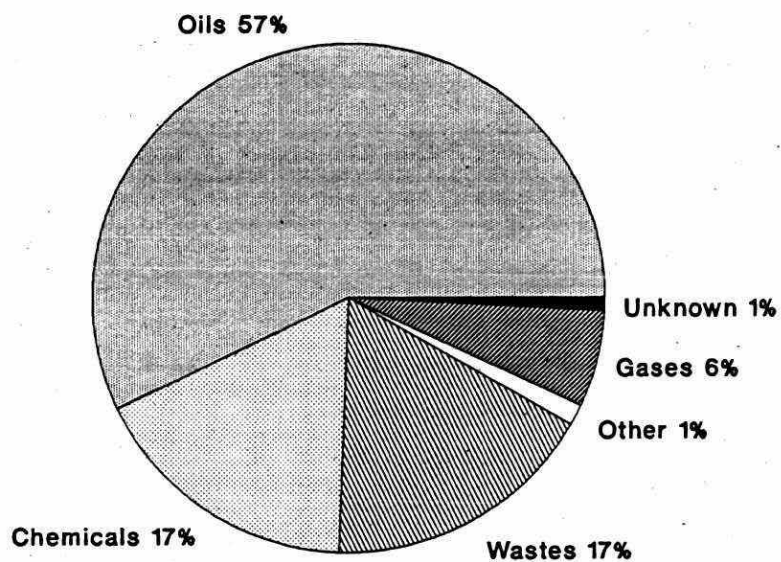
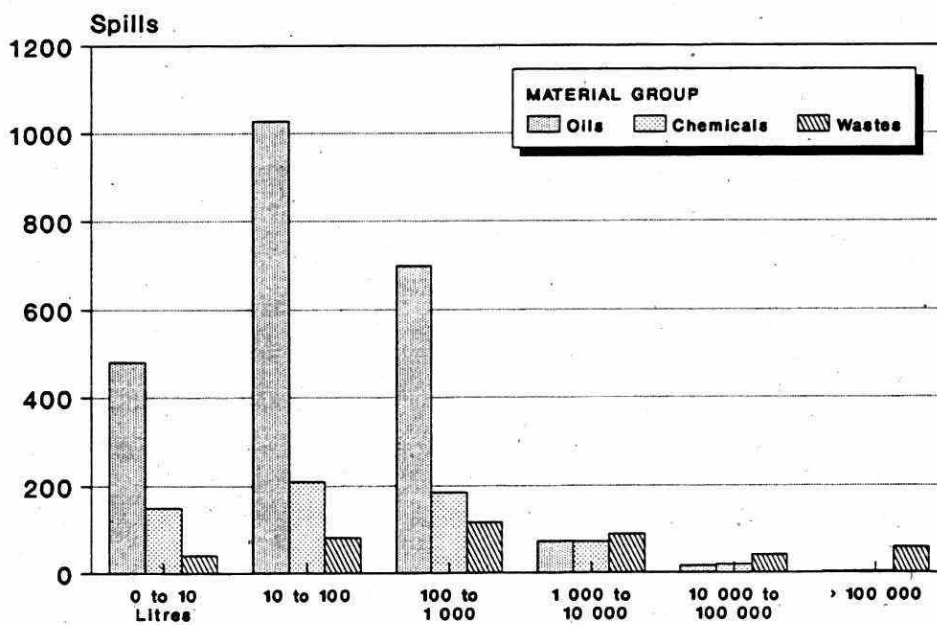


Figure 4  
Spill Volumes By Material Type



## Oils

In 1993, 2852 of the materials spilled were oils, accounting for 57% of all spilled materials. Many of these are operating fuels that spilled as a result of transportation accidents or fuel leaks from fixed storage facilities.

About 81% of all oil spills had a reported volume. Cumulatively, 21% of these spills were less than 10 litres each, 66% were less than 100 litres, and 96% were less than 1,000 litres. As the data in Table 4 shows, spills of oils involving volumes between 10 and 100 litres was the single largest grouping, accounting for 29% of all spilled materials (of spills where the volume spilled was known). The second largest grouping was spills of oils involving volumes between 100 and 1,000 litres. Many of these spills were discharges from motor vehicle fuel tanks and residential furnace oil storage tanks.

## Chemicals

In 1993, 864 of the materials spilled were chemicals accounting for 17% of all spilled materials.

About 74% of all chemical spills had a volume reported. Cumulatively, 24% of these spills were less than 10 litres each, 56% were less than 100 litres, and 85% were less than 1 000 litres. The chemical category includes chemical solutions. The contaminant of concern (the chemical) often constitutes a relatively small portion of the total volume spilled. Consequently, spills of chemicals are frequently greater in volume than oils.

## Gases

Three hundred and five of the materials spilled were in gaseous form, accounting for 6% of all spilled materials. It is difficult to quantify the volume of gas emitted to air in an occurrence. Few such reports contain volume information. In 1993, only 25% of the gaseous spills had a known volume.

## Wastes

Spills of wastes accounted for 17% of all spilled materials. This category includes materials that were considered wastes *prior* to the spill occurrence. They may have originated as byproducts of industrial processes or may involve unusually high concentrations of pollutants in otherwise normal wastewater discharges.

About 50% of all waste spills were of a known volume. Cumulatively, 10% of these spills were less than 10 litres each, 29% were less than 100 litres, 56% were less than 1,000 litres, 77% were less than 10,000 litres, and 86% were less than 100,000 litres. A relatively higher percentage of waste spills (as compared to the oil and chemical categories) involved volumes larger than 1,000 litres. Spills involving wastes typically involve larger volumes because this category includes wastewater discharges that are often large volumes with a small percentage of contaminant or contaminants at concentrations just above acceptable levels.

**Other Materials**

Spills of other materials, not included in the four groups mentioned above, accounted for 1% of all spilled materials. Fewer than 1% of all spilled materials were not identified and were documented as unknown.

## ENVIRONMENTAL IMPACT

The spills summarized in this report involve a wide range of materials, quantities, and circumstances, all of which can contribute to the impact of the spill on the environment. In order to provide some measure of the seriousness of a spill, the Ministry documents the likelihood of an environmental impact resulting from each spill. In 1993, an environmental impact was confirmed for 26% of all spills. An additional 41% of the spills had possible environmental impacts. The remaining 33% of the spills did not have anticipated environmental impacts. Table 5 summarizes the likelihood of impact for the spills where a confirmed or possible impact was identified. This information is illustrated in Figure 5.

**TABLE 5**  
**Nature of Environmental Impact**

IMPACT	CONFIRMED	POSSIBLE
Soil Contamination	933	806
Water Pollution	145	794
Air Pollution	48	169
Multi-Media Pollution	59	121
Human Health/Safety	13	41
Other Impact	24	23
Vegetation Damage	12	10
Injury to Wild Life	10	0
<b>TOTAL</b>	<b>1 244</b>	<b>1 964</b>

The environmental impact data field is not an accurate indicator of the full extent of the impact. For example, a spill that has a confirmed soil contamination impact may involve a spill of a small volume of material, necessitating the removal of a few shovels-full of contaminated soil. A spill of a larger volume may involve the removal of several hundred cubic metres of contaminated soil, however the impact for both would be *soil contamination*. The true extent of environmental impact for individual spills depends on a number of factors, including the volume and type of substance spilled, the location, the extent of the impact and the season. Combining the individual impacts of each spill does not provide a realistic measure of the cumulative impacts of all spills on the environment.

Figure 6 reflects the environmental impact of spills which had confirmed or possible impacts. The figure shows clearly that the largest confirmed impact was soil contamination. The figure also shows that a significant proportion of spills were identified as having a possible or confirmed water pollution impact. Only a small number of spills posed a threat to human health and safety.

Figure 5  
Environmental Impact

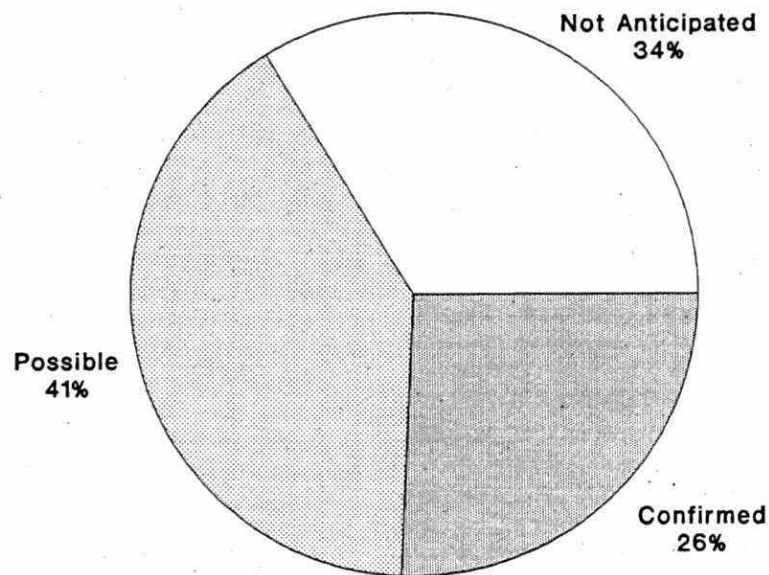
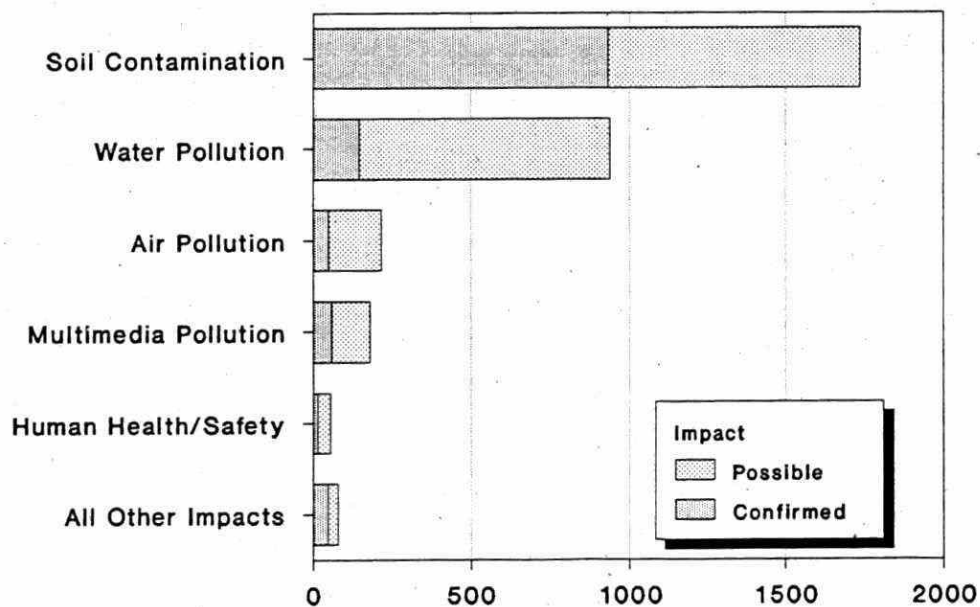


Figure 6  
Nature of Environmental Impact





## SPILL CLEANUP

Part X of the Environmental Protection Act requires that spills be cleaned up promptly and to the extent practicable. It places the primary cleanup responsibility on the discharger, that is the person who owned as well as the person who had control of the pollutant immediately prior to the spill. In most cases, spills are cleaned up by the person responsible for the discharge, or a contractor hired by them. Municipalities can, and often do, clean up spills, particularly if the spill occurs on municipal roads or into a municipal drainage system or watercourse.

The cleanup success rate by spill medium is summarized in Table 6 and in Figures 7 and 8. The success of cleanup efforts is dependent upon a number of factors, including the properties of the spilled material, the accessibility of the spill site, the availability of expertise and resources, and the time required to mobilize a response. Environmental factors play a role as well, since weather and light conditions, and the type of soil or watercourse affected can further complicate or aid the success of the cleanup. As the data from 1993 indicates, spills to land have a much higher cleanup success rate than do spills to surface waters; releases of gaseous substances to the atmosphere are normally impossible to clean up. Spills to land & water or land & air have a higher clean up success rate than the spills to water or air alone. The spills to air & land, and the spills to water & air, typically involve materials that vapourize, making it possible to clean up the land or water-based component but not the airborne emission.

**TABLE 6**  
**Spill Cleanup By Medium**

SPILL MEDIUM	PERCENT CLEANED UP			
	0%	1-50%	51-90%	91-100%
Land	649	136	651	1786
Land & Water	145	58	88	99
Water	581	55	65	100
Water & Air	11	2	1	1
Air	336	1	3	5
Air & Land	29	9	14	16
<b>TOTAL</b>	<b>1 751</b>	<b>261</b>	<b>822</b>	<b>2 007</b>



Figure 7  
Spill Cleanup

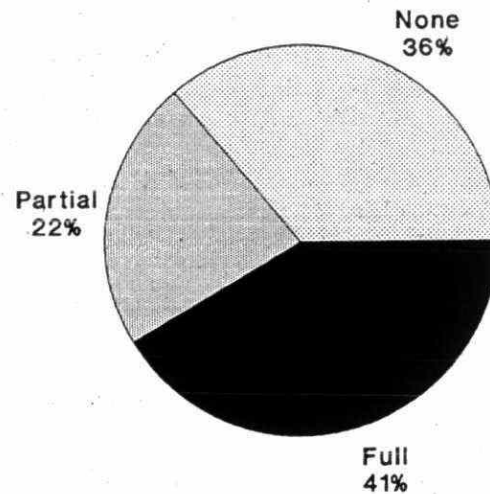
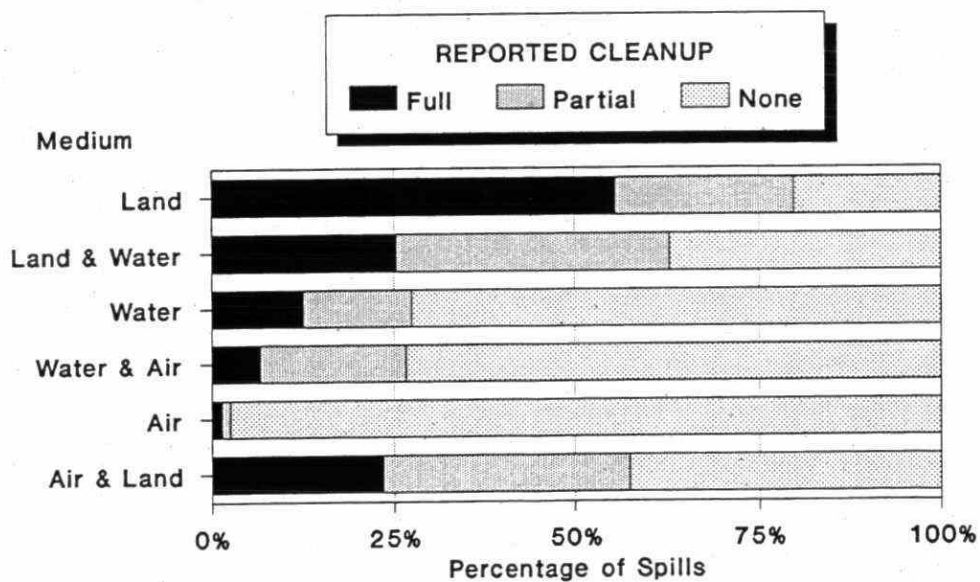


Figure 8  
Spill Cleanup By Medium



## SPILLS BY SECTOR AND SOURCE

Several years ago, the Canadian Department of Environment developed a computerized database called the *National Analysis of Trends in Emergencies System* (NATES). Like ORIS, this system uses a number of coded fields to classify environmental reports, thereby enabling the storage and analysis of information pertaining to spills. The MOEE adopted some of these codes for use with ORIS to ensure that different government agencies in Canada could exchange information easily. Each occurrence documented by the MOEE uses the NATES codes to classify the sector and source responsible for the discharge. In addition, ORIS uses Standard Industrial Classification codes to provide more detailed descriptions of the sector code. Together, these three codes are used to analyze the sectors and sources responsible for spills to the environment.

### Analysis By Sector

The industrial sectors with the largest numbers of reported spills in 1993 were transportation<sup>2</sup>, petroleum, chemical, metallurgical, and general manufacturing sectors. Collectively, spills from these five sectors accounted for nearly 44% of all spills reported in 1993. Electric utilities, sewage utilities and private residents accounted for the majority of non-industrial sector spills. Figure 9 summarizes spills by the various industrial and service sectors. Table 7 lists the number of spills for these sectors over the past 6 years.

**TABLE 7**  
**Spills By Sector – 1988 to 1993**

SECTOR	YEAR					
	1993	1992	1991	1990	1989	1988
Transportation	846	801	776	834	726	467
Electric Utilities	502	601	711	525	566	508
Petroleum	491	632	700	712	654	561
Chemical	279	261	343	492	454	334
Metallurgical	271	281	414	476	504	460
General Manufacturing	263	264	342	394	446	319
Sewage Utilities	248	282	248	296	250	198
All Others (Combined)	1 941	1 892	1 703	1 957	1 745	1 225

When combined, the spills of the seven sectors identified in Table 7 account for 60% of all spills reported in 1993. The petroleum sector and the electric utilities sector each had a significant reduction in the number of spills reported during 1993. The relative percentage of spills for each of the other sectors remained similar to past years.

<sup>2</sup> The transportation sector includes companies and individuals whose *only* business is providing transportation services. Spills from vehicles owned or operated by the other sectors (e.g. petroleum, chemical) are included in the figures for each of those sectors, even though they involved a mode of transportation.

Figure 9  
Spills By Sector

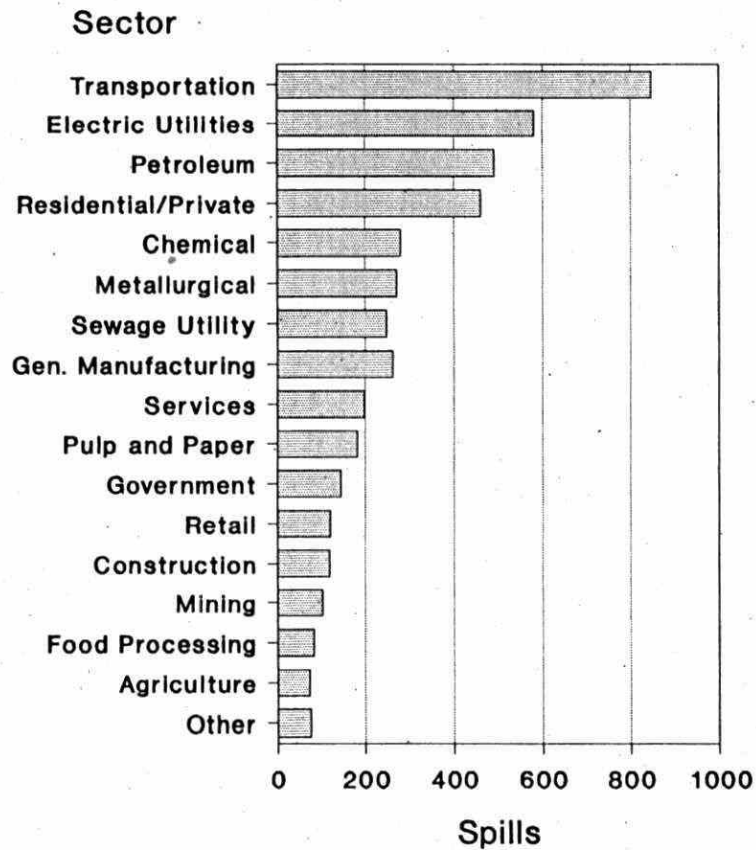
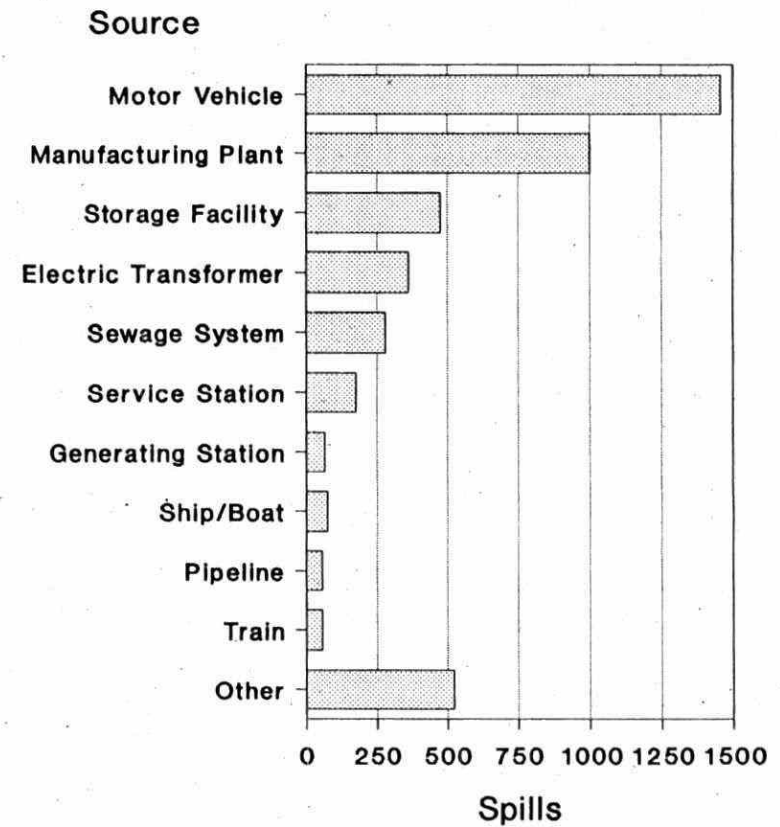


Figure 10  
Spills By Source



Source and Sector were  
unknown for 337 Spills.

## Analysis By Source

The source categories with the largest number of reported spills in 1993 were motor vehicle, manufacturing plant or factory, storage facility, electric transformer or capacitor, sewage system and vehicle service station. Together, these 6 categories accounted for 77% of all reported spills. Table 8 provides a comparison of these sectors spills from 1988 to 1993. Figure 10 is a summary of spills arranged by the source of the discharge.

**TABLE 8**  
**Spills By Source – 1988 to 1993**

SOURCE	YEAR					
	1993	1992	1991	1990	1989	1988
Motor Vehicle	1 457	1 419	1 364	1 412	1 127	718
Manufacturing Plant/Factory	1 001	968	1 305	1 571	1 572	1 284
Storage Facility	477	508	524	659	372	243
Electric Transformer	362	393	412	407	334	313
Sewage System	278	349	268	307	274	230
Vehicle Service Station	176	218	269	316	263	217
All Others (Combined)	1 090	1 159	1 095	1 014	1 403	1 067

## Spills By Sector and Source

A summary of the typical combinations of sector and source codes provides additional information. There are a possible 238 sector and source code combinations<sup>3</sup>, of which 13 combinations account for 62% of all spills. By adding the remaining spills which involve motor vehicles, storage facilities and manufacturing plants, 72% of all spills are accounted for. Table 9 lists the major combinations of source and sector codes used in 1993.

**TABLE 9**  
**Spills By Sector and Source**

SECTOR	SOURCE	SPILLS	PERCENTAGE
Transportation	Motor Vehicle	687	14
Electric Utilities	Transformer	353	7
Chemical	Manufacturing Plant	249	5
Sewage Utilities	Sewage System	232	5
Metallurgical	Manufacturing Plant	226	5
General Manufacturing	Manufacturing Plant	225	5
Residential	Storage Facility	201	4
Residential	Motor Vehicle	178	4
Pulp & Paper	Manufacturing Plant	174	4
Petroleum	Motor Vehicle	151	3
Petroleum	Service Station	135	3
Electric Utilities	Motor Vehicle	105	2
Petroleum	Storage Facility	78	2
All Other Sectors (Combined)	Motor Vehicle	336	7
All Other Sectors (Combined)	Storage Facility	198	4
All Other Sectors (Combined)	Manufacturing Plant	127	3

<sup>3</sup> Refer to Appendix III for a complete table of all the sector and source combinations.

The highlights of the combined sector and source data presented in Table 9 are:

- The *transportation-motor vehicle* combination accounted for 14% of all spills. These include spills of cargo and operating fluids, primarily from transport trucks and tankers. Adding the spills from the motor vehicles of all other sectors brings this total to 1 457 spills (30% of all spills). Spills from other transport modes (aircraft, watercraft and trains) account for an additional 143 spills.
- If the *chemical, petroleum, metallurgical and pulp and paper manufacturing plants'* spills are combined, they account for 18% of all spills. This figure increases to 21% when the spills from all other sectors' manufacturing plants are included.
- The *electric utility-transformer* combination accounted for 7% of all spills. Ontario has a vast network of these units, increasing the potential for this type of spill. Typically, these spills involve small amounts of oil spilled when transformers fail or are accidentally ruptured. Cleanup of these spills is a routine matter for most utilities.
- The *sewage utilities-sewage systems* combination accounted for 5% of all spills. These spills included sewage bypasses caused by equipment failure at sewage plants and pumping stations, and breaks in sewer forcemains.
- There were 201 spills from *residential-storage facilities*. This combination is used to classify spills of furnace oil from residential storage tanks and represents 4% of all spills. These spills are usually larger in volume than the average oil spill and often involve people of limited or little resources.
- There were 135 spills involving the *petroleum-service station* combination during 1993. An additional 78 spills occurred at *petroleum sector storage depots*. The service stations are typically retail outlets for vehicle fuels, while the storage depots are usually privately operated sites where fuels are stored in bulk quantities. Spills at these sites typically involve leaks of petroleum products from storage tanks, fuel draining from hoses, and overflows that occur while vehicle tanks are being filled.

In some cases, the Ministry is unable to determine the source of a spill. Typically, these occurrences involve spills to roads, ditches or watercourses where the source of the material is undetermined. Some of these occurrences also involve the illegal dumping of materials. The source and sector was not known for 294 spills (6%) reported in 1993.

## SPILLS BY CAUSE AND REASON

ORIS uses the NATES codes as a basis for summarizing the cause and reason for each spill. The "cause" is used to describe how a spill occurred and the "reason" attempts to clarify the cause by identifying the primary contributing factor. For example, a *transportation accident* (cause) due to *adverse road conditions* (reason) is a typical combination.

Table 10 summarizes the 9 major cause categories for 1993. Together, these categories account for 93% of all reported spills. The relative percentages for these categories have remained similar throughout the past five years. Table 11 summarizes the most frequently reported reason categories for spills in 1993. Together, these seven categories accounted for 88% of all spills reported in 1993. The same categories accounted for a similar percentage of spills in previous years.

**TABLE 10**  
**Spills By Cause – 1988 to 1993**

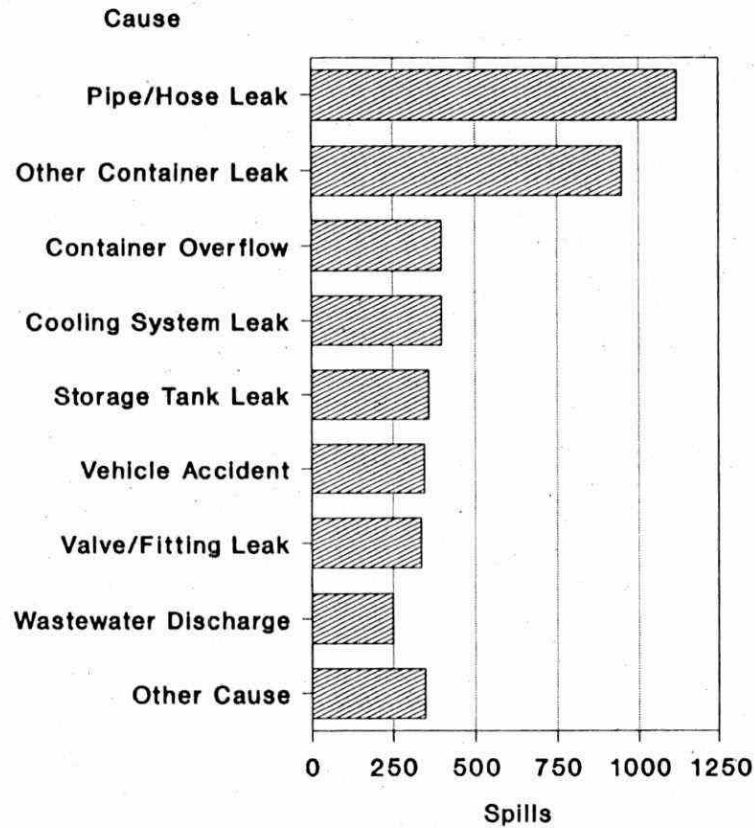
CAUSE	YEAR					
	1993	1992	1991	1990	1989	1988
Pipe or Hose Leak	1 120	996	974	803	595	291
Container Leak	949	1 025	1 002	1 109	712	472
Container Overflow	399	390	533	672	492	455
Cooling System Leak	398	453	464	441	387	260
Storage Tank Leak	359	377	369	388	330	237
Motor Vehicle Accident	345	339	306	338	428	394
Valve or Fitting Leak	336	370	431	419	407	319
Wastewater Discharge	250	317	346	387	547	361
Unknown	337	376	310	334	427	518
All Others (Combined)	348	371	502	795	1020	765

**TABLE 11**  
**Spills By Reason – 1988 to 1993**

REASON	YEAR					
	1993	1992	1991	1990	1989	1988
Equipment Failure	1121	1 235	1 124	1 327	1 028	892
Error	1058	1 172	1 343	985	760	533
Container Failure	721	576	743	794	671	334
Damage By Equipment	160	148	210	239	199	44
Storm or Flood	136	178	124	145	84	107
Intentional/Planned	128	107	127	190	208	120
Unknown	923	830	741	950	1 445	1 347
All Others (Combined)	594	771	825	1056	950	695

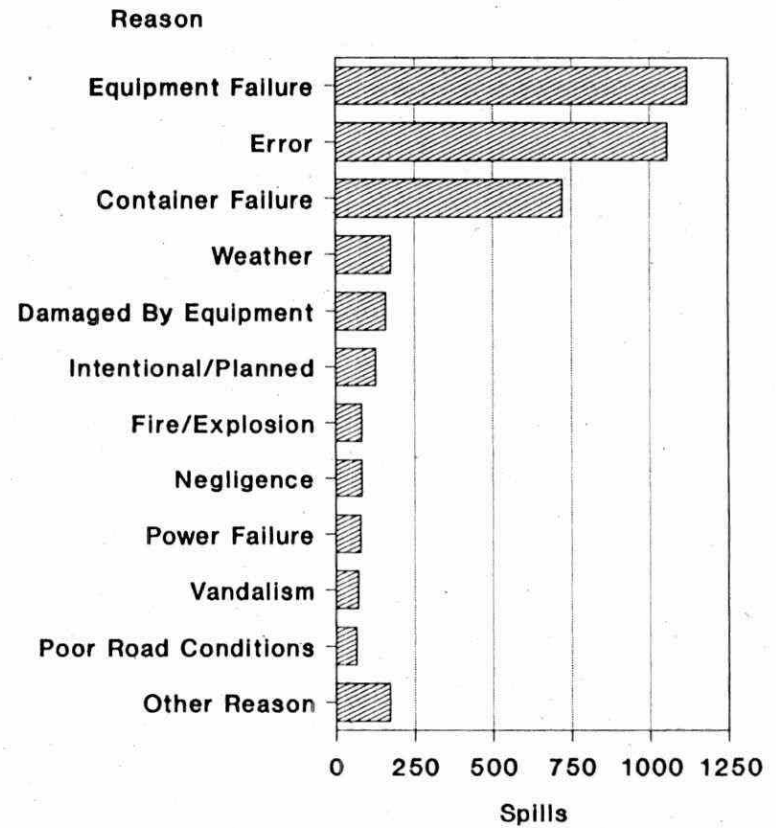


Figure 11  
Spills By Cause



The cause was not known for 337 Spills

Figure 12  
Spills By Reason



The reason was not known for 934 Spills

Figures 11 and 12 summarize the various causes and reasons attributed to spills in 1993. Container leaks, pipe or hose leaks and container overflows caused nearly half of all spills. Equipment failure and operator error were the major reasons for spills. These values are consistent with those presented in previous years.

On each occurrence report, the cause and reason codes are used in conjunction to indicate why and how a spill occurred. An examination of the cause and reason codes used in 1993 reveals that, of a possible 506 combinations<sup>4</sup>, 11 accounted for nearly half of all occurrences. Table 12 summarizes these combinations.

**TABLE 12**  
**Spills By Cause and Reason for 1993**

CAUSE	REASON	SPILLS
Pipe or Hose Leak	Equipment Failure	416
Pipe or Hose Leak	Container Failure	286
Other Container Leak	Error	253
Motor Vehicle Accident	Error	228
Container Overflow	Error	200
Pipe or Hose Leak	Error	186
Valve or Fitting Leak	Equipment Failure	163
Storage Tank Leak	Container Failure	150
Other Container Leak	Container Failure	130
Other Container Leak	Equipment Failure	119
Cooling System Leak	Equipment Failure	116
All Others (Combined)	All Others (Combined)	2594

<sup>4</sup> Refer to Appendix IV for a complete table of all the cause and reason combinations.



## SPILLS TO THE GREAT LAKES SYSTEM

The Great Lakes are a vital component of Ontario's ecosystem. They contain about 20% of all of the world's fresh water. This section of the report focuses on oils and chemicals that spilled directly to the waters of the Great Lakes system. Although spills constitute a very small fraction of total pollution loadings to the Great Lakes, the immediate impact of some spills can have a significant local impact. Shore-based facilities, ships and effluent pipes are all potential discharge points for contaminants.

In 1993, there were 162 spills of oils and chemicals (including chemical solutions) to the Great Lakes system, 41 fewer than in 1992. Figure 13 shows the number of spills to each of the Great Lakes, and their connecting channels, for 1993. Table 13 summarizes these spills by watercourse and sector.

**TABLE 13**  
**Spills of Oils And Chemicals by Watercourse and Sector**

SECTOR	WATERCOURSE										TOTAL
	Lake Superior	St. Marys River	Lake Huron	St. Clair River	Detroit River	Lake Erie	Niagara River	Welland Canal	Lake Ontario	St. Lawrence River	
Chemical				6	3	2	1			3	15
Food					1				1		2
Other Government			2					1	2		5
General Mfg.				8	1				5	1	15
Hydro Utilities	1		8			2			11		22
Metallurgical		1						1	3		5
Petroleum			1	5		4			4		14
Pulp & Paper	6									14	20
Residential			3	1	1	1			8	1	15
Retail			1						2	1	4
Service	1								1		2
Sewage Utilities	1								1		2
Transportation			4	3	1	1		1	6	1	17
Other			2		1				6	2	11
Unknown		1	5			1		1	3	2	13
<b>TOTAL</b>	<b>9</b>	<b>2</b>	<b>26</b>	<b>23</b>	<b>8</b>	<b>11</b>	<b>1</b>	<b>4</b>	<b>53</b>	<b>25</b>	<b>162</b>

Table 14 and Figure 14 summarize the total number of materials spilled in the oil and chemical groupings. Figure 14 reflects the number of oil and chemical spills to the Great Lakes in volume groups. Of the spills where the volume was reported, 86% were of volumes of less than 1,000 litres. The results from previous years are similar.

Figure 13  
Spills of Oils and Chemicals  
to the Great Lakes System

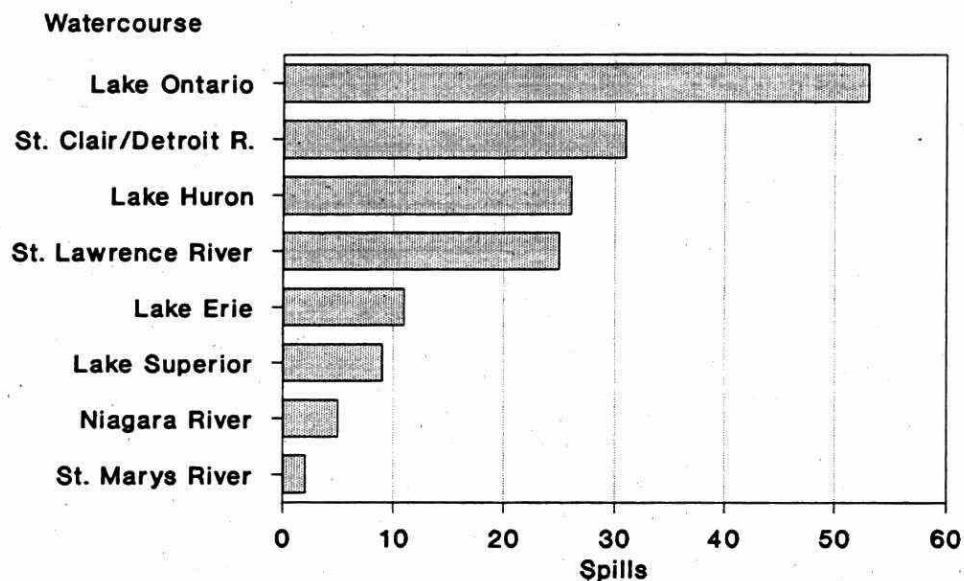
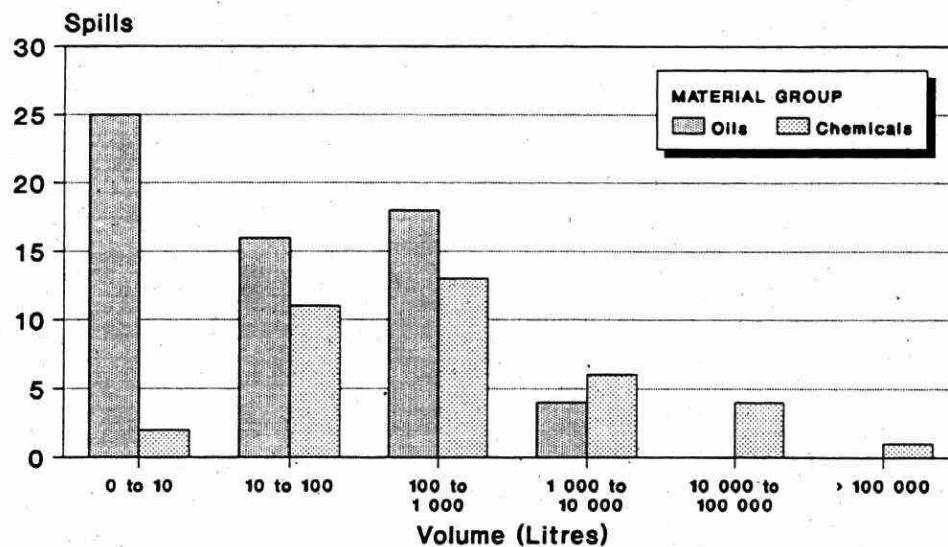


Figure 14  
Great Lakes Spill Volumes  
By Material Type



Volume was known for 100 of 162 (61%)  
Spills to the Great Lakes System  
Involving Oils and Chemicals

**TABLE 14**  
**Great Lakes Spills of Oils and Chemicals By Watercourse and Volume**

MATERIAL & VOLUME (L)		WATERCOURSE										TOTAL
		Lake Superior	St. Marys River	Lake Huron	St. Clair River	Detroit River	Lake Erie	Niagara River	Welland Canal	Lake Ontario	St. Lawrence River	
OILS	Unknown	3		9	1	2	2		1	20	6	44
	0-10			7	7		3		1	6	1	25
	10-100	3		5	3	1	1			11	1	25
	100-1 000		1	2	1	1	3		2	4	4	18
	1 000-10 000			1		1				2		4
	10 000-100 000											0
CHEMICALS	Unknown	3	1	4	2	4	1			2	2	19
	0-10			1				1				2
	10-100			1	7					3		11
	100-1 000			3	2					3	5	13
	1 000-10 000						1			1	4	6
	10 000-100 000	1								1	2	4
TOTAL	> 100 000									1		1
		10	2	33	23	9	11	1	4	54	25	172

Note: the 172 volumes of spilled materials summarized in Table 14 were the result of the 162 spill events shown in Table 13. i.e., some of the 162 reported spills involved two or more spilled materials.

#### Lake Superior

There were 9 spills of oils and chemicals to Lake Superior in 1993. Two-thirds of these were from operations of the pulp and paper sector.

#### St. Marys River

There were 2 spills of oils and chemicals to St. Marys River in 1993, one from metallurgical sector operations and one from pulp and paper sector.

#### Lake Huron and Georgian Bay

There were 26 spills of oils and chemicals to Lake Huron and Georgian Bay in 1993. Eight were from electric utility operations and four were from transportation sector sources.

#### St. Clair River, Lake St. Clair and Detroit River

There were 31 spills of oils and chemicals to these waters in 1993. Eight spills were from general manufacturing operations, six spills occurred at chemical sector sites, five were from petroleum sector operations, and four were from transportation sector sources.

### Lake Erie

There were 11 spills of oils and chemicals to Lake Erie in 1993. Four were from petroleum sector operations, two were from electric utilities' operations, and two were from chemical sector facilities.

### Niagara River and Welland Canal

There were five spills of oils and chemicals to these watercourses in 1993, including one each from operations of the chemical, government, transportation and metallurgical sectors.

### Lake Ontario

There were 53 spills of oils and chemicals to Lake Ontario in 1993. Eleven spills were from electric utilities, eight from private or residential sources (mainly watercraft), six from transportation sector sources, five from general manufacturing sector sources, and five from general manufacturing sector sources.

### St. Lawrence River

There were 25 spills of oils and chemicals to the St. Lawrence River in 1993. Fourteen spills were from pulp and paper facilities, and three were from chemical sector facilities.

## SPILL CLEANUP IN THE GREAT LAKES

Spills are most difficult to deal with when they impact open water bodies. Currents encountered in the interconnecting channels of the Great Lakes make cleanup even more difficult. Spills of chemicals add another level of difficulty to cleanup efforts, and spills of soluble chemicals, chemical suspensions, or solutions are essentially impossible to clean up.

The cleanup percentage reported for each of the oil and chemical spills to the Great Lakes in 1993 is shown in Table 15. The figures indicate that 66% of these spills were not cleaned up; 20% were mostly or completely cleaned up and the remaining 14% were partially cleaned up. The oil spills had a better cleanup rate than the chemicals, for reasons described in the Spill Cleanup section of this report.

**TABLE 15**  
**Spill Cleanup By Material Type**

MATERIAL TYPE	PERCENT CLEANED UP			
	0%	1-50%	51-90%	91-100%
Oils	59	13	14	22
Chemicals	48	2	3	1
<b>TOTAL</b>	<b>107</b>	<b>15</b>	<b>17</b>	<b>23</b>

## PLANNING FOR SPILL CONTINGENCIES

The Ministry of Environment and Energy is actively involved in planning for spill contingencies. The Ministry's Contingency Planning Program provides advice and assistance to industry, government agencies and others who may have, or respond to, environmental spills. Industries are encouraged to develop spill contingency plans in order to prepare themselves for the eventuality of a spill. In some instances however, the resources of the discharger may be insufficient to deal with a major spill. Several contingency plans are in place to provide a mechanism to deal with such spills when they occur, and these are outlined below.

### **The Canada/United States Water Quality Agreement**

Under the *Canada/United States Water Quality Agreement* signed by the Prime Minister of Canada and the President of the United States, the two countries agreed to establish mechanisms to deal with spills, pollution monitoring and pollution abatement in waters shared by the two countries. The Agreement calls for a joint contingency plan which organizes the national, provincial/state, and local resources to deal with spills.

### **The Canada/United States Joint Marine Pollution Contingency Plan**

The *Joint Canada/United States Marine Pollution Contingency Plan* establishes the mechanism, as required by the Canada/United States Water Quality Agreement, under which both countries will respond to spills which affect or may affect the other. This plan depends on supporting plans at the federal, provincial/state, and municipal levels. Under this plan, the coast guard of the country in which the spill originates is in charge and MOEE, through the Province of Ontario Spill Contingency Plan, acts in a support role and gives advice on environmental matters. The Ministry's field support is provided through the Regional offices and MOEE's executive support on the International Joint Response Team is provided by the Spills Action Centre. This team is made up of representatives of the responding agencies from both countries and provides an advisory service to the coast guard in charge.

### **The Canadian Marine Contingency Plan**

The *Canadian Marine Contingency Plan* deals with spills from vessels in navigable waters which do not cross the international border. The Canadian Coast Guard is in charge under this plan. Under this plan, MOEE again provides a support and advisory role similar in structure as mentioned above.

### **The Province of Ontario Contingency Plan For Spills of Oil and other Hazardous Materials**

The purpose of the *Province of Ontario Contingency Plan for Spills of Oil and Hazardous Materials* is to establish a reporting and notification protocol for all spills and to provide a mechanism to deal with major spills under provincial jurisdiction which threaten the environment. It also provides the mechanism through which provincial efforts are coordinated under the contingency plans discussed above. The Plan deals with the containment, clean-up, and disposal



phases of spills and is subordinate to plans which deal with contingencies where the threat to life and property is of primary concern. For major spills within MOEE's mandate, the Plan places MOEE in charge and draws on the Ministries of Natural Resources, Health, Labour, Solicitor General, Consumer and Commercial Relations, and Transportation. Two federal agencies, Environment Canada and the Canadian Coast Guard, are also signatories. The Plan relies on a response team concept, consisting of representatives of the participating agencies.

## **The Province of Ontario Nuclear Plan**

The *Province of Ontario Nuclear Plan* is designed to coordinate the response to major events involving nuclear generating facilities. The Plan establishes several groups and organizations on which MOEE serves. MOEE's participation includes sampling under the direction of the Ministry of Labour, participation on the Provincial Ingestion Control Group and the Provincial Restoration Committee established under the Plan.

## **The Spills Prevention Strategy**

The increasing number of reported spills from 1988 to 1990 prompted the Ministry to implement the *Spills Prevention Strategy*. A detailed review of reported spills was undertaken and about 35 companies which had multiple spills at any one location were initially included in this program. Following a series of meetings with identified sources, 29 companies were required to submit comprehensive workplans addressing the following:

- Spill history review and risk assessment,
- An assessment of spill detection, diversion, containment and treatment systems and an implementation schedule for upgrade requirements,
- Emergency response plans and procedures, and
- Environmental awareness training.

The Ministry encourages those companies and individuals who are not included in this strategy to assess their operations and minimize the potential for spills. Assistance in this regard is available through the Ministry's Contingency Planning Office.

**APPENDIX I**

**SAMPLE OCCURRENCE REPORT**





1. Received by		ORIS No.		I.E.B. No.	
2. Type of Occurrence <div style="display: flex; justify-content: space-between; align-items: center;"><div><input type="checkbox"/> Occurrence Code</div><div><input type="text"/> <input type="text"/> Sub. Cat. Code</div></div>			Occurrence Date YY MM DD		Time (24 Hr. Clock) : :
Reported by (Name/Organization)			Date Reported YY MM DD		Time (24 Hr. Clock) : :
Tel. No.		Alternate Tel. No.		Date MOE at Scene YY MM DD	
Address			Postal Code <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		Assigned To: Person/Program
3. Location of Occurrence			4. Source (Name of company/person, Process Area, Address)		
MOE Region Code <input type="text"/>			MOE Dist. Code <input type="text"/> <input type="text"/>		
Municipal Code <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			Sector Code <input type="text"/> <input type="text"/>		
Source Code <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			SIC Code <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		
5. Synopsis (75 Characters Maximum)					
6. Summary (Attachments accompanying this report: If Yes <input type="checkbox"/> number and list them in this section)					
Multiple reports on single incident: If <input type="checkbox"/> Yes, record initial/master regional number here >>					
7. Follow-up Action <input type="checkbox"/> Abatement <input type="checkbox"/> I.E.B. <input type="checkbox"/> Other (Section Code) YY MM DD					
File Closed: <input type="checkbox"/> Abatement <input type="checkbox"/> IEB <input type="checkbox"/> Other					
Complainant Contacted <input type="checkbox"/> CON <input type="checkbox"/> CAT <input type="checkbox"/> CNR YY MM DD					
Suspected Violation Code <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
8. Report prepared by			Completion Date YY MM DD		
Print/Initial			I.E.B. Investigator Assigned		
Approving Officer			Date YY MM DD		
Print/Initial			IEB Supervisor		
Date YY MM DD			Print/Initial		

Specify number(s), indicating the routing of the original

Specify number(s), indicating the distribution of the copies

1	2	3	4	5	6	7
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Continued ☐ Yes

☐ 1 Investigator or Environmental Officer

☐ 2 District Officer/File

☐ 3 SAC (all spills)

☐ 4 Reg. Dir./ Mgr.

☐ 5 IEB Reg. Supervisor

☐ 6 IEB Head Office/File

☐ 7 Other

## Occurrence Report

Complete appropriate boxes in this section if this page is used		
ORIS No.	I.E.B. No.	Page of

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**APPENDIX II**

**SPIILLS BY MATERIAL GROUP AND VOLUME**

# Spills By Material Groups and Volumes

MATERIALS		VOLUME (litres)							TOTALS	
		Unknown	0-10	10-100	100-1000	1000-10000	10000-100000	100000-1000000		
OILS	Crude Oil	2		2	4	1			9	
	Light Fuels	111	78	168	54	12	3	2	428	
	Light Oils	345	365	802	585	48	10	2	2157	
	Heavy Oils	24	19	35	43	10	3		134	
	Other Oils	60	12	16	9	3			100	
	Non-Petroleum Oils	9	6	5	3		1		24	
	GROUP TOTAL	551	480	1028	698	74	17	4	2852	57.1%
CHEMICALS	Acids	24	17	27	24	10	1		103	
	Bases	13	1	5	5	10			34	
	Halogenated Solvents	3	4	4	1				12	
	Non-Halogenated Solvents	41	28	41	24	6			140	
	Pesticides	14	6	10	10	4			44	
	PCBs	11	39	16	5		1		72	
	Other Organic	60	30	57	63	14	8		232	
	Other Inorganic	57	26	50	54	28	9	3	227	
	GROUP TOTAL	223	151	210	186	72	19	3	864	17.3%
GASES	Smoke	50							50	
	Dust/Particulate	26	2	1	4	1			34	
	NOx	7							7	
	SOx	12	1	2	1				16	
	Natural Gas	10						2	12	
	Other Gases	124	10	17	18	8	3	6	186	
	GROUP TOTAL	229	13	20	23	9	3	8	305	6.1%
WASTES	Liquid Industrial	125	4	33	44	44	30	21	301	
	Hazardous Solid	4		2	1				7	
	Non-Hazardous Solid	20		1	3	1			25	
	Sewage	172		10	34	31	8	28	283	
	Agricultural	7			3	3			13	
	Other	108	37	36	32	10	3	10	236	
	GROUP TOTAL	436	41	82	117	89	41	59	865	17.3%
OTHER	Feed & Foodstuffs	5	1	3	6	5	2		22	
	Other	24		2	5	6	5	2	44	
	GROUP TOTAL	29	1	5	11	11	7	2	66	1.3%
UNKNOWN		32	1	6	3	1			43	0.8%
TOTALS		1500	687	1351	1038	256	87	76	4995	
		30%	14%	27%	21%	5%	2%	2%		

**APPENDIX III**

**SECTOR AND SOURCE MATRIX**

## ORIS SECTOR AND SOURCE CODES

Descriptions of the ORIS Sector and Source Codes are provided below to help explain the categories used in Table III.1

### **SECTOR DESCRIPTIONS**

<b>Chemical</b>	- manufacturers of basic chemicals or feed stocks (including derivative products).
<b>Food Processing</b>	- food processing operations (not including distribution and retail operations)
<b>Metallurgical</b>	- primary refiners of metal ore and scrap metal
<b>Mining</b>	- mining operations (aggregate pit operators, ore mining, etc.)
<b>Petroleum</b>	- manufacturers and retailers of petroleum products
<b>Pulp &amp; Paper</b>	- processors of wood pulp and manufacturers paper products
<b>Other Manufacturing</b>	- manufacturing operations that are not included in any of the more specific manufacturing sectors
<b>Agriculture</b>	- all farming operations including co-ops, farms and ranches.
<b>Construction</b>	- construction companies, builders and contractors
<b>Hydro Utilities</b>	- utilities (both provincial and municipal) which provide electricity to consumers
<b>Sewage Utilities</b>	- utilities (both provincial and municipal) which operate sewage systems
<b>Government</b>	- administrative and other government operations not otherwise specified
<b>Retail</b>	- stores which sell products to consumers
<b>Services</b>	- companies/individuals who provide a service, as opposed to a product (i.e. dry cleaners, hotels/motels, educational facilities, etc.)
<b>Transportation</b>	- companies/individuals whose <u>only</u> business is providing transportation services
<b>Residential/Private</b>	- private citizens

### **SOURCE DESCRIPTIONS**

<b>Aircraft</b>	- all airborne modes of transport
<b>Marine Tanker/Carrier</b>	- waterborne carriers of bulk cargo
<b>Other Watercraft</b>	- other waterborne modes of transport (i.e. ferries, motor boats, etc.)
<b>Train</b>	- vehicles which run exclusively on rails
<b>Motor Vehicle</b>	- automobiles, trucks, motorcycles, etc.
<b>Pipeline</b>	- bulk transport lines (excluding "in-plant" piping networks)
<b>Service Station</b>	- all vehicle servicing facilities (gas stations, marinas)
<b>Storage Facility</b>	- includes all types of storage facilities, both private and commercial
<b>Heat/Power Station</b>	- electrical generating stations (thermal, nuclear and hydroelectric)
<b>Manufacturing Plant</b>	- all manufacturing and processing facilities
<b>Sewage System</b>	- municipal/industrial waste water collection systems (including residential septic systems)
<b>Electric Transformer</b>	- electrical transformers, capacitors, etc.
<b>Water Supply</b>	- municipal water distribution systems

Note that vehicles operated by sectors *other than* transportation (see definition above) are defined as belonging to the sector that operates them. Spills from such vehicles are included in the totals for that specific sector, not the transportation sector.

**Spills By  
Sector and Source**

SECTOR	SOURCE														TOTAL
	Aircraft	Marine Tanker/Carrier	Other Watercraft	Train	Motor Vehicle	Pipeline	Service Station	Storage Facility	Heat/Power Plant	Manufacturing Plant	Sewage System	Transformer	Water Supply	Other	
Agriculture				1	20		1	16		4				32	74
Chemical					26			3		249				1	279
Construction					58	1		3		1	2			55	120
Food					17		1	3		59	2			2	84
Government	2		1		46	3	1	23						69	145
General Mfg.					15		1	12		225				10	263
Hydro Utilities			1		105	1		8	61			353		53	582
Metallurgical					13			1	1	226	18			12	271
Mining					12	6		6		11	2	1	2	63	103
Petroleum		1	3		151	46	135	78		49				28	491
Pulp & Paper					9					174					183
Residential	2		24		178			201			18	5	1	33	462
Retail					20		21	54		1				25	121
Service		1			75		12	26	4	2	1	3		74	198
Sewage Utilities					1						232		15		248
Transportation	8	7	19	56	687	1	4	38			3			23	846
Other			17		24			5	1					30	77
TOTAL	12	9	65	57	1457	58	176	477	67	1001	278	362	18	510	4547

The Source and Sector Information was not known for 294 spills.



**APPENDIX IV**

**CAUSE AND REASON MATRIX**

## ORIS CAUSE AND REASON CODES

Descriptions of the ORIS Cause and Reason Codes are provided below to help explain the categories used in Table IV.1.

### CAUSE DESCRIPTIONS

<b>Watercraft Accident</b>	- collision, grounding or sinking of ships, barges, pleasure craft, etc.
<b>Derailment</b>	- accidents where railcars or locomotives leave the rails
<b>Aircraft Crash</b>	- accidents involving aircraft
<b>Motor Vehicle Accident</b>	- road vehicle accidents, truck/trailer overturns
<b>Container Overflow</b>	- overfilling of storage tanks, vehicle fuel/cargo tanks, lagoons, etc.
<b>Pipe/Hose Leak</b>	- discharges from pipes and hoses (other than cooling systems)
<b>Valve/Fitting Leak</b>	- leaks from specific components of equipment, containers and pipelines
<b>Storage Tank Leak</b>	- discharges from stationary above-ground and below-ground storage tanks
<b>Cooling System Leak</b>	- discharges from electricity transformers and capacitors, vehicle radiators, nuclear reactors
<b>Dyke Failure</b>	- failure of storage pond or lagoon walls
<b>Other Container Leak</b>	- spills from containers other than those specified above
<b>Wastewater Discharge</b>	- accidental or unusual variation of wastewater discharges to watercourses from manufacturing/processing facilities, generating stations and sewage plants
<b>Process Start/Stop</b>	- emissions resulting from a change in operating conditions
<b>Process Upset</b>	- an unusual variation in the <i>regular</i> discharge of a contaminant to air due to a fluctuation in the process
<b>Unknown</b>	- cause not determined
<b>Other</b>	- cause not otherwise specified

### REASON CODE DESCRIPTIONS

<b>Intentional/Planned</b>	- intentional or planned release
<b>Error</b>	- releases due to mistakes by humans
<b>Vandalism</b>	- illegal/deliberate releases (including sabotage)
<b>Ice/Frost Damage</b>	- freezing, frost heave, the weight of snow or ice, or falling ice
<b>Power Failure</b>	- loss of electrical power
<b>Fire/Explosion</b>	- fires or explosions ( <i>not</i> releases that <i>cause</i> a fire or explosion)
<b>Storm/Flood</b>	- storms, floods, lightning, wind, etc.
<b>Equipment Failure</b>	- malfunctions in system components
<b>Container Failure</b>	- corrosion, overpressure, material failure, failure of welds or seams
<b>Damage by Moving Equipment</b>	- containers damaged by vehicles
<b>Gasket/Joint</b>	- failure of any point of connection
<b>Apparent Negligence</b>	- releases due to a lack of diligence
<b>Adverse Road Condition</b>	- road faults, rain, ice or snow, debris on road
<b>Unknown</b>	- reason not determined
<b>Other</b>	- reason not otherwise specified

**Spills By  
Cause and Reason**

CAUSE	REASON														TOTAL
	Intentional/Planned	Error	Vandalism	Ice/Frost Damage	Power Failure	Fire/Explosion	Storm/Flood	Equipment Failure	Container Failure	Damage By Moving Equipment	Adverse Road Condition	Apparent Negligence	Unknown	Other	
Watercraft Accident		1				5			1				7		14
Derailment		2						2					2		6
Aircraft Crash		1						1	1				5	1	9
Motor Vehicle Accident		228						14	5	5	41	1	44	7	345
Overflow	1	200	1	5	11	1	19	89	8	1		24	27	12	399
Pipe/Hose Leak	5	186	16	16	3	5	3	416	286	28	5	6	111	34	1120
Valve/Fitting Leak	1	62	1	7	2			163	57	4	1		33	5	336
Storage Tank Leak	2	35	5	7	1	2	1	43	150	12		4	85	12	369
Cooling System Leak		25	4	1	1	19	72	116	59	61		3	27	10	398
Dyke Failure							2	1					3	5	11
Other Container Leak	56	253	32	5	3	23	4	119	130	49	16	28	187	44	949
Wastewater Discharge	13	24	3		44		25	84	11				34	12	250
Process Upset		8			10	4	1	46	10				10	10	99
Process Start/Stop	9	6	1		3		1	10	2					1	33
Other	39	26	8			24	6	16	1			16	22	18	176
<b>TOTAL</b>	<b>126</b>	<b>1057</b>	<b>71</b>	<b>41</b>	<b>78</b>	<b>83</b>	<b>134</b>	<b>1120</b>	<b>721</b>	<b>160</b>	<b>63</b>	<b>82</b>	<b>597</b>	<b>171</b>	<b>4504</b>

The Cause and Reason Information was not known for 337 spills.

**APPENDIX V**

**SPILLS BY MUNICIPAL LOCATION**

**Spills By Municipal Location 1991 to 1993**

MUNICIPALITY	YEAR		
	1993	1992	1991
Metropolitan Toronto	495	529	559
Hamilton-Wentworth R.M.	290	355	498
Ottawa-Carleton R.M.	266	232	218
Niagara R.M.	247	233	302
Peel R.M.	242	218	192
Thunder Bay District	239	188	207
Sudbury R.M.	181	202	124
York R.M.	176	179	153
Lambton County	150	177	236
Simcoe County	138	148	129
Waterloo R.M.	127	132	135
Leeds & Grenville County	126	132	138
Durham R.M.	125	150	141
Haldimand-Norfolk R.M.	122	116	152
Stormont, Dundas & Glengarry County	112	131	162
Halton R.M.	111	130	130
Kenora District	99	84	71
Essex County	88	79	83
Algoma District	85	111	169
Nipissing District	85	77	86
Cochrane District	84	95	104
Middlesex County	82	91	96
Renfrew County	78	97	65
Wellington County	78	83	62
Hastings County	77	80	93
Muskoka D.M.	68	70	38
Bruce County	64	62	49
Frontenac County	62	62	65
Sudbury District	57	46	48
Peterborough County	53	68	71
Kent County	53	43	53
Grey County	52	42	48
Timiskaming District	51	36	46
Parry Sound District	47	55	40
Rainy River District	43	35	26
Northumberland County	41	56	54
Oxford County	39	36	53
Huron County	37	45	35
Prescott & Russell County	37	44	35
Lanark County	36	35	39
Brant County	32	46	50
Lennox & Addington County	31	31	27
Elgin County	28	28	31
Victoria County	27	36	42
Perth County	22	22	35
Dufferin County	20	21	15
Haliburton County	13	16	6
Manitoulin District	11	9	9
Prince Edward County	10	19	15
Out-of-Province	4	2	4
<b>TOTALS</b>	<b>4841</b>	<b>5014</b>	<b>5239</b>

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